

AMENDMENTS TO THE DRAWINGS

Replacement formal drawings for Figs. 1 and 6 have been filed concurrently.

REMARKS

In view of the above amendments and following remarks, reconsideration and further examination are requested.

Initially, in reply to the objection to the drawings as expressed in section 1 of the Office Action, replacement formal drawings have been provided for Figs. 1 and 6 so as to remove from these figures reference numeral 55 and its lead line. Additionally, the replacement formal drawing for Fig. 6 differs from originally filed Fig. 6 by changing " α° " to $-\alpha-$.

In reply to the objections to the disclosure and abstract as expressed in sections 2 and 3 of the Office Action, the specification has been reviewed and revised, and the revisions have been presented in the form of a substitute specification and abstract. Please note that the abstract is now a single paragraph. No new matter has been added by the substitute specification and abstract.

In reply to the objections to the claims, the 35 U.S.C. § 112, first paragraph, rejection of claims 1-7, and the 35 U.S.C. § 112, second paragraph, rejection of claims 1-7, claims 1-7 have been canceled and claims 8-16 have been added. New claims 8-16 have been drafted taking into account the bases for these objections and rejections, are believed to be free of these issues, and are otherwise believed to be in compliance with 35 U.S.C. § 112, first and second paragraphs. With regard to the 35 U.S.C. § 112, second paragraph, rejection of claim 3 (current claim 13), it is respectfully submitted that even though the intersection of the curves may occur at a different value of L/R (due to a different geometry or size of the separation chamber), one having ordinary skill in the art would nonetheless understand the scope and content of this claim. That is, one having ordinary skill in the art would understand this claim to require that the ratio L/R is greater than the value L/R at which this intersection occurs.

The instant invention pertains to a compressor comprising a compressing mechanism for compressing a fluid that contains lubricating oil, and a separation chamber that is to have revolved therein fluid compressed by the compressing mechanism such that at least part of the lubricating oil contained in the fluid is separated by centrifugal force produced by revolution of

the fluid within the separation chamber. Such a compressor is generally known in the art, but suffers from drawbacks as expressed on pages 1-2 of the original specification.

Applicants have addressed and resolved these drawbacks by providing a compressor including, as shown in Figs. 1 and 6 for example, a compressing mechanism, a separation chamber 51, an exhaust hole 58 for exhausting from the separation chamber fluid compressed by the compressing mechanism, and a feed hole 53 for introducing into the separation chamber fluid, compressed by the compressing mechanism, in a direction downwardly away from the exhaust hole. Because the fluid is introduced into the separation chamber in a direction downwardly away from the exhaust hole, lubricating oil mist contained in this fluid can be suppressed from being supplied into a refrigerating and air conditioning system via the exhaust hole. New claim 8 is believed to be representative of Applicants' inventive compressor.

Claim 1 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of copending application No. 10/482,170; claim 1 was provisionally rejected under 35 U.S.C. § 102(e) as being anticipated by copending application No. 10/482,170; claims 1-7 were rejected under 35 U.S.C. § 102(f) because the Applicant did not invent the claimed subject matter; claims 1-7 were rejected under 35 U.S.C. § 102(b) as being anticipated by Hisanaga et al.; and claims 1-7 were rejected under 35 U.S.C. § 102(e) as being anticipated by Kawata et al. These rejections are respectfully traversed, and the relied-upon references are not applicable with regard to the newly added claims for the following reasons.

Claim 8 recites

A compressor comprising:
a compressing mechanism for compressing a fluid that contains lubricating oil;
a separation chamber having an interior space that is to have revolved therein fluid compressed by said compressing mechanism such that at least part of the lubricating oil contained in the fluid is separated from the fluid by centrifugal force produced by revolution of the fluid within said interior space;
an exhaust hole for exhausting from said interior space the fluid compressed by said compressing mechanism after having been revolved in said interior space; and

a feed hole for introducing into said interior space the fluid,
compressed by said compressing mechanism, in a direction
downwardly away from said exhaust hole.

Thus, claim 8 generally corresponds to a combination of former claims 1 and 5 after having been modified in view of the rejections of claim 5 issued by the Examiner. Accordingly, the rejections of claim 5 will be addressed as they pertain to claim 8.

In rejecting claim 5 as being anticipated by Hisanaga et al., the Examiner equated entrance passage 122 with the claimed “feed hole” and provided an explanation as to why fluid introduced into separation chamber 19 from this passage is introduced into the separation chamber in a direction substantially departing from an opening of delivery port 104. Similarly, in rejecting claim 5 as being anticipated by Kawata et al. the Examiner equated introducing hole 53 with the claimed “feed hole” and provided an explanation as to why fluid introduced into separation chamber 51 from this hole is introduced into the separation chamber in a direction substantially departing from a bottom opening of discharge pipe 56.

As alluded to previously, in view of these positions expressed by the Examiner, claim 8 has been drafted to more specifically recite what is intended by the recitation that fluid being introduced into the separation chamber from the feed hole is introduced in a direction substantially departing from the exhaust hole. In this regard, claim 8 recites

a feed hole for introducing into said interior space the fluid,
compressed by said compressing mechanism, in a direction
downwardly away from said exhaust hole.

The entrance passage 122 of Hisanaga et al., is not for introducing into separation chamber 19 fluid in a direction downwardly away from delivery port 104. Similarly, the introducing hole 53 of Kawata et al. is not for introducing into separation chamber 51 fluid in a direction downwardly away from any opening of discharge pipe 56.


Thus, claim 8 is not anticipated by either of Hisanaga et al. and Kawata et al., and claims 8-16 are allowable over these references either taken alone or in combination. Also, any basis for a rejection of claim 8 under 35 U.S.C. § 102(f) is believed to be lacking. See MPEP Section 2137.

In view of the above amendments and remarks, it is respectfully submitted that the present application is in condition for allowance and an early Notice of Allowance is earnestly solicited.

If after reviewing this Amendment, the Examiner believes that any issues remain which must be resolved before the application can be passed to issue, the Examiner is invited to contact the Applicants' undersigned representative by telephone to resolve such issues.

Respectfully submitted,

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DESCRIPTION

COMPRESSOR

TECHNICAL FIELD

5 The present invention relates to a compressor used in an air conditioner for an automobile or the like, from among compressors for compressing refrigerant.

BACKGROUND ART

10 In a compressor for compressing fluid, part of lubricating oil for lubricating sliding parts of a compressing mechanism is discharged from the compressor together with compressed fluid, and circulates in-during a refrigerating and air conditioning cycle. As ~~the~~ a quantity of lubricating oil discharged into the fluid during the cycle ~~together with the fluid~~ increases, ~~the~~ system efficiency (heat efficiency) declines. Accordingly, to enhance the system efficiency, ~~the~~ contained
15 lubricating oil is separated as much as possible from the fluid compressed by the compressing mechanism. ~~The~~ This separated fluid is discharged into ~~the~~ a system cycle. Such examples are disclosed in Japanese Laid-open Patent No. H11-82352 (Fig. 1, Fig. 3, Fig. 4), and Japanese Laid-open Patent No. 2001-295767 (Fig. 1, Fig.
20 2). In such a conventional compressor comprising a centrifugal separation chamber, high pressure refrigerant gas containing lubricating oil compressed by ~~the~~ a compressing mechanism is guided into ~~the~~ a centrifugal separation chamber. This refrigerant gas revolves in ~~the~~ this circular columnar separation chamber. By centrifugal force of this revolution, ~~the~~ misty lubricating oil contained in the refrigerant gas contacts ~~with the~~ an inner wall of the separation chamber. As a result,
25 the misty lubricating oil is separated from the refrigerant gas. ~~The~~ This

conventional compressor comprising the centrifugal separation chamber has a pipes called a separation pipes provided in ~~all parts of the~~ separation chamber. The refrigerant gas introduced into the separation chamber revolves in a cylindrical space of circular section formed between an outer circumference of the separation pipe ~~outer circumference and separation chamber~~ an inner circumference of the separation chamber. Thus, in ~~the a~~ centrifugal lubricating oil separation system, generally, a separation pipes ~~are~~ is regarded to be an essential constituent elements. That is, to enhance ~~the~~ separation efficiency of lubricating oil, ~~the~~ refrigerant gas must be revolved securely in the separation chamber. For this purpose, it is considered essential to install a separation pipes in the separation chamber and revolve the refrigerant gas ~~on~~ along the circumference. Such system of installing a separation pipes in the separation chamber results in a large-large-sized of separation chamber. Moreover, ~~the a~~ number of parts is increased, ~~the and~~ manufacturing cost of the separation chamber is raised; as is ~~the a~~ number of processes increased for assembling the separation pipes, ~~and thereby~~ whereby it is a serious problem to reduce ~~the~~ manufacturing costs of the compressor.

It is hence an object of the invention to solve these conventional problems and present a compressor high in terms of separation efficiency of lubricating oil, reduced in ~~the terms of a~~ size of a compression chamber, and lowered in terms of manufacturing cost.

DISCLOSURE SUMMARY OF THE INVENTION

The invention presents a compressor comprising a compressing mechanism for compressing a fluid that contains lubricating oil, and a separation chamber that is to have revolved therein ~~by having introduced therein~~ ~~the~~ fluid compressed by the

compressing mechanism, and in which at least part of ~~the~~ lubricating oil contained in the fluid is separated by ~~the~~ centrifugal force produced by this revolution, in which only ~~the~~ this introduced fluid is present in the separation chamber.

5 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal sectional view showing an example of a compressor in a preferred embodiment.

Fig. 2 is a sectional view along A-A (operation chamber sectional view) of the compressor shown in Fig. 1.

10 Fig. 3 is a sectional view along B-B (high pressure case seen from operation chamber side) of the compressor shown in Fig. 1.

Fig. 4 is a sectional view along C-C near ~~the~~ a separation chamber of the compressor shown in Fig. 1.

15 Fig. 5 is a diagram showing ~~the~~ a relationship of between degree of eccentricity (L/R) of a feed hole in the separation chamber and oil circulation rate (OCR).

Fig. 6 is a longitudinal sectional view showing ~~other~~ another example of a high pressure case of the preferred embodiment ~~shown in~~ of Fig. 1.

20 Fig. 7 is a lateral sectional view near the separation chamber showing ~~other~~ another example of a slender passage of the preferred embodiment ~~shown in~~ of Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 A preferred embodiment of the invention is described below while referring to the accompanying drawings. Drawings are schematic diagrams, and do not

represent ~~the~~ a configuration of parts in correct dimensions.

(Preferred embodiment)

~~The~~ A compressor shown in Fig. 1 to Fig. 3 is a so-called vane rotary type compressor, and circular columnar rotor 2 is disposed in cylinder 1 having a cylindrical inner wall. Rotor 2 is disposed at such a position that part of its outer circumference may form a slight gap ~~to~~ with the inner wall of cylinder 1.

Rotor 2 includes a plurality of vane slots 3. Vane 4 is slidably inserted in each vane slot 3.

Rotor 2 is formed integrally with driving shaft 5 which is rotatably supported. Cylinder 1 and rotor 2 are inserted between front plate 6 and rear plate 7 in ~~the~~ a rotary shaft direction of rotor 2.

Both ends of cylinder 1 are closed by ~~the~~ templates 6 and 7, and operation chamber 8 is formed in cylinder 1 for compressing a fluid.

Suction port 9 and discharge port 10 communicate with operation chamber 8. Fluid such as refrigerant gas is sucked from suction port 9 into operation chamber 8, and compressed and discharged from discharge port 10. At ~~the~~ an outlet of discharge port 10, discharge valve 11 composed of, for example, a reed valve is disposed.

High pressure case 12 is installed at ~~the~~ a rear side of rear plate 7.

High pressure case 12 includes separation chamber 51 for separating and collecting misty lubricating oil contained in the refrigerant gas compressed in operation chamber 8. The fluid compressed in operation chamber 8 and discharged from discharge port 10 flows into guide passage 13 provided continuously in cylinder 1, rear plate 7 and high pressure case 12. The fluid further passes through feed hole 53 formed in ~~the~~ a side wall of separation chamber 51, and flows into

separation chamber 51.

In ~~the~~a upper part of separation chamber 51; is a gas exhaust hole 58 for exhausting refrigerant gas from which lubricating oil ~~is~~has been separated in separation chamber 51 ~~has an opening~~.

5 In ~~the~~a lower part of separation chamber 51; is an oil discharge hole 54 for discharging lubricating oil separated from refrigerant gas and collected in separation chamber 51 ~~has an opening~~.

10 The refrigerant gas exhausted through gas exhaust hole 58 from separation chamber 51 circulates in a refrigerating and air conditioning cycle. The refrigerant gas returns to suction port 9, and is compressed again and circulates in the refrigerating and air conditioning cycle.

15 Oil discharge hole 54 ~~having an opening~~ in the lower part of separation chamber 51 communicates with oil-storage chamber 52 formed between high pressure case 12 and rear plate 7. Therefore, the lubricating oil separated ~~and collected~~ from the refrigerant gas in separation chamber 51, and collected, passes through oil discharge hole 54 and is stored in oil-storage chamber 52.

20 The lubricating oil stored in oil-storage chamber 52 is supplied ~~into~~to rotor 2, vane 4, the inner wall of cylinder 1 and other parts through oil-supply passage 18, and lubricates these parts. The lubricating oil is further supplied into vane back pressure chamber 17, and works to force vane 4 to outside of rotor 2 by its pressure.

25 The lubricating oil is supplied through oil-supply passage 18 for supplying lubricating oil from oil-storage chamber 52 into ~~the~~a compressing mechanism. In oil-supply passage 18, the lubricating oil stored in oil-storage chamber 52 is supplied through vane back pressure adjusting apparatus 16. Depending on ~~the~~a refrigerant gas pressure around the compressing mechanism, vane back pressure

adjusting apparatus 16 controls ~~the~~a feed pressure and feed amount of lubricating oil to be supplied into the compressing mechanism.

~~The~~Operation of the compressor in this preferred embodiment is described below.

5 Receiving power transmission from a driving source such as car-mount engine, as shown in Fig. 2, driving shaft 5 and rotor 2 rotate clockwise. By this rotation, refrigerant gas of low pressure flows into operation chamber 8 from suction port 9.

Along with rotation of rotor 2, compressed refrigerant gas of high pressure pushes up discharge valve 11 from discharge port 10, and flows into guide passage
10 13. Further, ~~the~~refrigerant of high pressure passes through feed hole 53, and flows into separation chamber 51. In separation chamber 51, ~~the~~lubricating oil contained in the refrigerant gas is separated and collected. Separation chamber 51 shown in Fig. 1 is a so-called centrifugal oil separator. It is composed by mutually coupling circular columnar space 49 and an inverted conical space.

15 ~~The~~An inside-interior of the separation chamber 51 does not include a separation pipes used in a conventional centrifugal compressor. Thus, ~~The inside interior~~ of the separation chamber is a hollow space, and only ~~the~~introduced refrigerant gas (partly ~~mixing the~~mixed with lubricating oil contained in the compressor) is present. Further, the ~~inside-interior~~ of separation chamber is free
20 from bumps and dents which may disturb revolution of refrigerant gas introduced into separation chamber 51. Feed hole 53 is disposed eccentrically from ~~the~~a central axis of circular columnar space 49 of separation chamber 51. The refrigerant gas introduced into separation chamber 51 is guided in ~~the~~a tangential direction of circular columnar space 49. That is, the refrigerant gas flows into separation
25 chamber 51 along ~~the~~an inner circumference of circular columnar space 49.

Therefore, the refrigerant gas introduced into separation chamber 51 revolves in ~~the~~ a peripheral direction in separation chamber 51. By ~~the~~ a centrifugal force of revolution, ~~the~~ lubricating oil of heavier specific gravity contacts with ~~the~~ an inner wall of separation chamber, and is separated from the refrigerant gas.

5 ~~The~~ This separated lubricating oil moves down along the inner circumference of circular columnar space 49, and is collected in ~~the~~ a center ~~by~~ of the inverted conical space.

Between ~~the~~ an upper part of oil-storage chamber 52 and separation chamber 51, communication passage 57 is provided for communicating ~~them~~ mutually with these chambers. Like feed hole 53, communication passage 57 is provided
10 eccentrically from the central axis of separation chamber 51.

In this structure, ~~the~~ fluid introduced into separation chamber 51 through communication passage 57 is guided into the tangential direction of circular columnar space 49. That is, the fluid flows into separation chamber 51 along the
15 inner circumference of circular columnar space 49. As a result, the fluid flowing into separation chamber 51 from oil-storage chamber 52 through communication passage 57 smoothly converges on revolution of refrigerant gas in separation chamber 51. That is, disturbance of revolution of refrigerant gas can be suppressed. If the lubricating oil in oil-storage chamber 52 reaches up to communication passage
20 57 due to some cause, the lubricating oil is guided into separation chamber 51 by way of communication passage 57. Since ~~the~~ a flowing direction of lubricating oil into separation chamber 51 is a direction to converge on ~~the~~ a revolving flow in separation chamber 51 as mentioned above, revolution of refrigerant gas in separation chamber 51 is not disturbed.

25 In ~~the~~ a case of the compressor of this preferred embodiment, ~~the~~ an opening at

the ~~an~~ oil-storage chamber side of oil discharge hole 54 is positioned below the ~~an~~ oil level in oil-storage chamber 52 in the ~~a~~ perpendicular direction.

Accordingly, the ~~refrigerant~~ gas of high pressure discharged from the compressing mechanism acts to push down the ~~an~~ oil level of lubricating oil collected in the lower part of separation chamber 51, and also push up the oil level of lubricating oil in oil-storage chamber 52.

However, when the lubricating oil in oil-storage chamber 52 is pushed up, the fluid (mainly refrigerant gas) gathering in the upper part of oil-storage chamber 52 may disturb elevation of the oil level of lubricating oil in oil-storage chamber 52.

In this preferred embodiment, between the upper part of the oil-storage chamber 52 and separation chamber 51, communication passage 57 is provided for allowing the fluid to move freely ~~therebetween-them~~. Communication passage 57 functions as a gas vent hole ~~of-for~~ fluid such as refrigerant gas gathering in the upper part of oil-storage chamber 52. As a result, the oil level of lubricating oil in oil-storage chamber 52 can be pushed up smoothly.

Communication passage 57 is provided so that the fluid flowing into separation chamber 51 from oil-storage chamber 52 may not disturb revolution of refrigerant gas in separation chamber 51. For this purpose, the ~~a~~ flowing direction of fluid from oil-storage chamber 52 into separation chamber 51 should not have a directional component ~~of-facing~~ and colliding ~~the-with~~ a revolving flow near the ~~an~~ outlet of communication passage 57. Therefore, the communication passage 57 may be provided along a direction orthogonal to the central axis of separation chamber 51.

In the preferred embodiment, the ~~an~~ opening of oil discharge hole 54 at the ~~a~~ side of oil-storage chamber 52 is positioned lower than the oil level in oil-storage

chamber 52 in ~~the~~ a perpendicular direction. However, the opening may also be also positioned higher than the oil level.

In this case, ~~the~~ an oil level push-up effect by refrigerant gas of high pressure is not expected. However, since communication passage 57 is provided, blow-back
 5 from oil discharge hole 54 by pulsation of refrigerant gas can be suppressed. Therefore, ~~it is~~ expected to be suppressed is scattering of ~~the~~ oil, collected in the lower part of separation chamber 51, into the separation chamber by blow-back.

It is a feature of the compressor of the invention that a separation pipes ~~are~~ is not provided in separation chamber 51 in spite of ~~the~~ this structure having ~~the~~ a so-called centrifugal separation chamber. Elimination of the separation pipes is
 10 realized by the following four technical factors.

A first factor is ~~the~~ a relative configuration of ~~the~~ a feed hole for feeding compressed refrigerant gas into separation chamber 51, and the separation chamber. The relative configuration refers to ~~the~~ a degree of eccentricity of the feed hole from
 15 the central axis of the separation chamber. The degree of eccentricity is specifically described below.

As shown in Fig. 4, suppose ~~the~~ a distance from central axis M of separation chamber 51 to the inner peripheral wall of circular columnar space 49 to be R. Further, suppose ~~the~~ a shortest distance from central axis M to a projection line of
 20 ~~the opening of~~ lead hole 53 projected in ~~the~~ a tangential direction (direction parallel to ~~the~~ a central axial line of feed hole) of columnar circular space 49 to be L. When thus defined, ~~the~~ a ratio of L and ~~to~~ R (L/R) is the degree of eccentricity. Assuming ~~the~~ a range of value of L to be 0 at minimum and R at maximum, the degree of eccentricity (L/R) is a value from 0 to 1.

25 The larger this value, the more eccentric is the feed hole relative to the

separation chamber. ~~The~~ A relationship between the degree of eccentricity and oil circulation rate (OCR) is compared between ~~the a case having a separation pipes in the separation chamber and the a case not having such a pipes in the separation chamber.~~ This relationship of the two is qualitatively shown in Fig. 5.

5 ~~The~~ OCR is defined in Japanese Industrial Standards (JIS B 8606). That is, ~~the~~ OCR represents ~~the a mass of lubricating oil in mixed solution relative to the a mass of a mixed solution of liquid refrigerant and lubricating oil lubricating that lubricates in the~~ during a cycle, and the unit is represented as a percentage. A

10 smaller value of OCR shows a higher oil separation efficiency. In Fig. 5, curve A represents the case with a separation pipes in the separation chamber and curve B represents the case without a separation pipes in the separation chamber. As shown in Fig. 5, in a region of a small degree of eccentricity, the OCR is smaller in the case with the separation pipes in the separation chamber. As the degree of eccentricity

becomes higher, the OCR difference narrows, and curve A and curve B intersect.

15 At a higher degree of eccentricity, the OCR values of curve A and curve B are inverted. Therefore, to present a refrigerating and air conditioning system of high efficiency by eliminating a separation pipes, it is preferred to define the degree of eccentricity higher than the degree of eccentricity corresponding to the intersection of both curves shown in Fig. 5. The present inventors discovered by simulation that

20 ~~a the~~ preferred degree of eccentricity (L/R) should be at least 0.4 or more.

~~Meanwhile~~ Alternatively, L may be defined as ~~the a~~ distance from the central axis M of the separation chamber to ~~the an~~ axis of a center of gravity of section of the feed hole. In this case, the degree of eccentricity may be at least 0.7 or more although but is variable depending on the a shape of the feed hole. Thus, a refrigerating and

25 air conditioning system of higher efficiency (lower OCR) is presented without using

a separation pipes in the separation chamber as compared with the case having such a pipes in the separation chamber.

A second factor is ~~the~~a configuration of gas exhaust hole 58 for exhausting refrigerant gas after separation of oil from the separation chamber, and a configuration of the~~an~~ opening of separation chamber 51. In the preferred embodiment shown in Fig. 1, ~~the opening of~~ gas exhaust hole 58 is provided in ~~the~~a central part of an upper end side of circular columnar space 49 of separation chamber 51.

~~The~~A sectional area of ~~the opening of~~ gas exhaust hole 58 is formed smaller than ~~the~~a sectional area of circular columnar space 49. ~~The opening of~~ gas exhaust hole 58 does not reach up to ~~the~~an outer circumference of circular columnar space 49. At ~~the~~an upper end of circular columnar space 49, reducing portion 56 is formed for reducing ~~the~~an inside diameter of circular columnar space 49 to ~~the~~an inside diameter of ~~opening of~~ gas exhaust hole 58. That is, ~~the opening of~~ gas exhaust hole 58 is coupled to the upper end side outer circumference of circular columnar space 49 by way of this reducing portion 56. ~~It hence~~Thus, ~~suppresses~~suppressed is escape of refrigerant gas, of high density and high speed containing much lubricating oil mist and introduced into separation chamber 51, from the separation chamber by hardly revolving in separation chamber 51. That is, assuming ~~the~~a flow velocity of refrigerant gas introduced into the separation chamber not to decline while revolving, the refrigerant gas (of high density) containing much lubricating oil mist of high specific gravity revolves around ~~the~~an outer circumference of ~~the~~this revolving flow along the inner wall of circular columnar space 49. As separation of lubricating oil is promoted, ~~it~~the oil gradually moves into ~~the~~a center of revolution as being pushed away by the refrigerant gas of

high density. Finally, gas is considered to be exhausted from the gas exhaust hole.

Actually, the refrigerant gas right after being introduced in the separation chamber is fastest in terms of flow velocity, and the flow velocity declines gradually during revolution. As the flow velocity declines, ~~the~~ a centrifugal force acting on the refrigerant gas decreases. Accordingly, the refrigerant gas of high density and high speed containing lubricating oil mist revolves on the outer circumference of the revolving flow along circular columnar space 49 in the separation chamber. As separation of lubricating oil is promoted, the refrigerant gas lowered in density and speed moves into ~~the~~ a center of revolution, and is exhausted from the gas exhaust hole. ~~It hence~~ Thus, suppresses-suppressed is escape of refrigerant gas, of high density and high speed containing much lubricating oil mist and introduced into separation chamber, from the separation chamber by hardly revolving in separation chamber 51. In the preferred embodiment shown in Fig. 1 and Fig. 4, reducing portion 56 is formed as an upper end at a right angle to the central axis of circular columnar space 49. However, it is not always limited to this structure. The reducing portion 56 may be formed as a slope inclined obliquely to the central axis of the circular columnar space. ~~It~~ The reducing portion may also be ~~also~~ formed as a moderate curve consecutive from the outer circumference of the circular columnar space. As ~~far~~ long as the reducing portion is present ~~in~~ the ~~along an~~ entire circumference of ~~the opening of~~ gas exhaust hole 58, ~~the~~ a central axis of the gas exhaust hole may be eccentric ~~from~~ relative to the center ~~central axis~~ of separation chamber 51.

A third factor is adjustment of direction of slender passage 21 communicating with feed hole 53 as shown in Fig. 6. That is, ~~the~~ refrigerant gas introduced into separation chamber 51 flows ~~into~~ separation chamber 51 in a direction departing

(downwardly away) from ~~the opening of~~ gas exhaust hole 58. In this manner, at least ~~the~~ refrigerant gas containing much lubricating oil mist and right after being introduced into separation chamber 51 can be moved away from ~~the opening of~~ gas exhaust hole 58. Thus, the refrigerant gas containing much lubricating oil mist right after introduction can be suppressed from being supplied into the refrigerating and air conditioning system from gas exhaust hole 58.

Meanwhile, if inclination angle α of central axis N of slender passage 21 and central axis M of separation chamber 51 is too small, ~~the~~ flow velocity of refrigerant gas introduced into separation chamber 51 cannot be utilized in ~~in~~ during revolution in separation chamber. As a result, it is considered that the OCR may drop. In order to obtain a high OCR, inclination angle α is preferred to be at least 60 degrees ~~or more~~ to at most 90 degrees ~~or less~~.

~~As the inner circumference of~~ The circular columnar space is departed expands in a direction away from the gas exhaust hole, ~~it is expanded,~~ and an inner wall of the columnar space is formed. As a result, ~~the~~ refrigerant gas of high density and high speed introduced into separation chamber 51 receives a centrifugal force, and is guided into ~~the~~ a most expanded inner circumference. Hence, ~~without~~ inclining slender passage 21 relative to central axis M of separation chamber 51, it is preferable because the refrigerant gas containing much lubricating oil mist and introduced in the separation chamber can be departed from ~~the opening of~~ gas exhaust hole 58.

A fourth factor is that slender passages 13A (see Fig. 1) and 21 (see Fig. 7) formed consecutively ~~to~~ with feed hole 53 ~~are~~ is provided in guide passage 13 for guiding refrigerant gas from discharge port 10 of the compressing mechanism to feed ~~port~~ hole 53 and into separation chamber 51.

In this structure, ~~these~~this slender passages (13A and 21) ~~have~~performs an action of straightening ~~the~~ refrigerant gas introduced into separation chamber 51. That is, disturbance or diffusion of flow of fluid flowing into separation chamber 51 can be suppressed. Moreover, not only ~~the~~ static pressure of ~~the~~ refrigerant gas of high pressure discharged from the compressing mechanism, but also dynamic pressure thereof, can be effectively utilized in revolution of refrigerant gas in separation chamber 51.

Four technical factors enabling to ~~eliminating~~eliminate a separation pipes are explained. These plural technical factors can be combined, and combined effects of these technical factors are expected. Further, these individual technical factors of the preferred embodiment can be further combined with other technical elements.

In one example of the preferred embodiment, a circular columnar space is explained as a columnar space of the separation chamber. However, the columnar space may have any sectional shape as ~~far~~long as ~~the~~ revolution of introduced refrigerant gas is not disturbed. For example, same effects are obtained by an elliptical section or a quadrilateral shape with round corners. ~~The~~A compressor having a centrifugal oil separation chamber of the invention can ~~get rid of~~eliminate a need for a separation pipes in the oil separation chamber. Since a separation pipes ~~are~~is not needed, a space for installing the separation pipes in the separation chamber is not needed. As a result, the separation chamber is reduced in size. It is further possible to lower ~~the~~a manufacturing cost of a compressor due to fabrication and assembling of a separation pipes. ~~The~~f fluid in the compressor of the invention means gas containing misty liquid.

INDUSTRIAL APPLICABILITY

The invention is not limited to a sliding vane type rotary compressor, but may be applied ~~in~~ also to a rolling piston type, scroll type, and other types of compressors.

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ABSTRACT OF THE DISCLOSURE

~~The compressor of the invention is reduced in the size of separation chamber by eliminating the separation pipes in the separation chamber, and is hence manufactured at low cost.~~

5 The A compressor of the invention is ~~a compressor comprising~~comprises a compressing mechanism (1, 2, 4) for compressing a fluid that contains lubricating oil, and a separation chamber (51) ~~that is~~ to have revolved therein ~~by having introduced thereinto the fluid compressed by the compressing mechanism, (1, 2, 4) and in which~~wherein at least part of the lubricating oil contained in the fluid is
10 separated by the centrifugal force produced by this revolution, ~~in which~~and wherein only ~~the~~this introduced fluid is present in the separation chamber.

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